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PATENT SPECIFICATION

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International Classification B 24 b.
Drawing attached.

COMPLETE SPECIFICATION.

CLEAR VIEW GRINDING DISC.

The following statement is a full description of this invention, including the best method of performing it known to me:-

The present invention relates to a so-called clear view grinding disc. Such grinding disc provided with openings in their working surfaces are employed so that the workpiece is brought into contact with the side of the grinding disc remote from the eye of the grinder and the grinding position is visible to the grinder's eye during the grinding operation through the openings of the disc. In connection with such operation it is of advantage if the workpiece is illuminated by a bundle of light rays reaching the grinding surface through the openings of the disc and reflected by the latter towards the grinder's eye. The workpiece is preferably fed to the disc from below whilst it is illuminated and observed from above. Of particular advantage are clear view grinding discs with elongated radial observation openings in the form of windows of uniform length and marginal slots, wherein the outer ends of the windows terminate at substantially the same distance from the disc edge and each slot is of the same depth. Discs of this type are hereinafter referred to in the description and claims as "the type described."

In discs which have so far been in use, the distance of the inner slot ends from the centre of the disc is approximately equal to the distance of the outer window ends from the said centre, so that a non-transparent or at least badly illuminated annular zone is produced in the range of the inner slot ends or outer window ends, respectively; this means that the grinding surface can be observed only incompletely or not at all when the workpiece is applied to the disc in this range. However, clear view grinding discs are

already known which have as openings holes arranged on a spiral starting from the centre of the disc, the centre of each hole lying on a circle concentric with the edge of the disc and touching the respective neighbouring holes, so that in principle uniform transparence of the disc should be obtained, but the thickness of the disc is large in comparison with the diameters of the holes; for this reason observation of the workpiece is possible only if the line of view runs parallel to the axes of the holes. It is therefore necessary to bend deeply over the disc during grinding, in order to look through the holes exactly from above and the application of the particularly favourable reflected light illumination is therefore almost impossible.

The disc with holes is disadvantageous for the further reason that at different distances from the disc centre, owing to the circular shape of the holes, different brightness values are obtained for the grinding surface to be observed since the sum of the respective hole widths measured on a circle concentric with the edge of the disc varies considerably. The other known clear view grinding discs, of which the windows or marginal slots have parallel side walls, also show the same disadvantage because the workpiece or grinding surface respectively appear less bright with increasing distance of the grinding point from the centre of the disc since the ratio between the sum of the openings and the full working surface becomes more unfavourable with increasing distance from the centre.

The present invention aims at an improvement of clear view grinding discs of type described, so that no non-transparent annular zone is obtained during grinding; the application or reflected light illumination becomes possible over the whole working range and uniform brightness in the latter is guaranteed.

The clear view grinding disc according to the present invention is characterized mainly by the feature that the depth of the marginal slots is greater than the distance of the outer ends of the windows from the disc edge by an extent equal to at least the thickness of the disc.

If the marginal slots were turned in relation to the windows so as to lie on the same radii there would be overlapping of slots and windows, which also makes it clear that the disc must be transparent in all spots and no so-called blind ring zone can appear. As the extent of overlapping is at least equal to the thickness of the disc, a clear view is ensured in the annular zone defined by the inner slot ends and outer window ends even if the direction of sight is inclined to the surface of the disc. For the same reason it is also possible without difficulty to light the workpiece applied to this zone or the grinding surface respectively by a bundle of light rays striking the surface of the disc at the same angle.

In order to avoid noticeable changes of the brightness values in the zone of overlapping, which is generally preferred for grinding because there more grip is ensured to the disc owing to the greater number of slot and window edges, respectively, within the said annular zone of the disc defined by the inner slot ends and outer window ends the sum of all slot and window widths measured on any circle concentric with the edge of the disc is constant.

If a disc of uniform brightness over the whole working range has to be produced then it is necessary for the sum of the window and slot widths, respectively, measured on a circle concentric with the edge of the disc to increase linearly with increasing distance from the centre, within the annular zone defined by the inner window ends and the edge of the disc. The combination of all slot and window areas will then yield a sector-shaped area, and it is clear that in such a case, on any circle concentric with the edge of the disc, there will be obtained the same ratio between the sum of the widths of the openings and the sum of the solid parts, thus ensuring uniform brightness at all points.

The object of the invention has been illustrated by way of example in the

accompanying drawings. Figure 1 shows a disc in plan view, Figure 2 is a cut-out from this disc on an enlarged scale, Figure 3 shows the disc in sections through a window and through a marginal slot with the two cuts turned into one plane. Figure 4 is a disc of the known kind shown in the same manner and Figure 5 represents a cut-out from a disc with differently shaped observation openings.

The clear view grinding disc 1, which may also be fitted with a sheet metal insert or the like, is provided with narrow radial observation openings in the form of windows 2, 2a and marginal slots 3, 3a. It can be seen that the depth t of the marginal slots 3, 3a is greater than the distance a of the outer ends 2, 2a of the windows from the edge of the disc by an extent equal at least to the thickness s of the disc. The comparisons according to Figures 3 and 4 illustrate the importance of the overlapping of marginal slots and windows. According to Figure 4 the marginal slots 3 end on the same circle, concentric with the edge of the disc, on which the outer ends of the windows 2 are found. If the workpiece w is applied in the range of this circle and has to be observed from above, the entire grinding area will not be visible unless the direction of sight is exactly at right angles to the front surface of the disc, however, only on the condition that lighting is also carried out exactly from above, which is practically impossible. If the light rays have the slightest inclination, the left half of the workpiece becomes already invisible because in the range of the windows it is covered by the edge of the disc and in the range of the slots it lies in the shadow produced by the inner edge of the slot. In the improved disc according to Figure 3, however, the grinding surface of the workpiece remains visible even if the direction of view is not exactly at right angles to the front surface of the grinding disc, and in this case illumination by reflected light can be applied without difficulty without part of the grinding surface being in the shadow. It is a matter of course that the greater the overlapping of marginal slots and windows, the more favourable will become these conditions.

According to Figures 1 and 2, the sum of the window and slot widths, respectively, measured on a circle concentric with the circumference of the disc will increase linearly with increasing distance from the centre of the disc, within the annular zone defined by the inner window ends and the edge of the disc.

One each slot and one each window will then be equivalent to a sector, and the combination of all slots and windows will of course also yield a sector of duly multiplied area. Within the ring-shaped disc-zone defined by the outer window ends and inner slot ends, the slot and window widths respectively measured on a circle, have been so chosen that one each slot width b_s increased by one window width b_f gives the width B of the imaginary sector on the same circle. It would of course also be possible to arrange between the windows two or more slots, the area of each of which equals a corresponding part of the marginal slot shown. If the mentioned geometrical conditions are fulfilled, perfectly uniform brightness values will be obtained during grinding for the whole working range of the disc, and the appearance of brighter or darker rings is avoided.

In the type of disc shown in Figure 5, the windows 2a have longitudinal edges parallel to those of the marginal slots 3a, so that the brightness of the illuminated grinding surface will slightly decrease with increasing distance from the centre of the disc. Within the annular zone of the disc defined by the inner ends of the slots and outer ends of the windows, which zone is generally preferred for working, a good view with satisfactory brightness is also guaranteed since here the sum of all slot widths b_s and window widths b_f as measured on a circle concentric with the circumference of the disc will always be constant.

Thus in the zone of overlapping, one each window and one each slot supplement one another in such a manner as if the window were continued in the same width to the edge of the disc.

The Claims defining the invention are as follows :-

1. Clear view grinding disc of the type described characterized by the feature that the depth of the marginal slots is greater than the distance of the outer ends of the windows from the edge of the grinding disc by an extent equal to at least the thickness of the disc. (20th April, 1961).

2. Grinding disc as claimed in Claim 1, characterized by the feature that, within the annular zone of the disc defined by the inner ends of the slots and outer ends of the windows, the sum of all slot and window widths measured on a circle concentric with the circumference of the disc remains constant. (20th April, 1961).

3. Grinding disc as claimed in Claim 1, characterized by the feature that, within the annular zone defined by the inner ends of the windows and the edge of the disc, the sum of all slot and window widths measured on a circle concentric with the circumference of the disc increases linearly with increasing distance from the disc centre. (20th April, 1961).

4. A grinding disc substantially as hereinbefore described with reference to Figures 1 to 3 or Figure 5 of the accompanying drawings. (20th April, 1961).

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Related Art:

Serial No.	Application No.	Classification.
165, 807	23, 156/53	75. 2; 75. 6
143, 405	30, 118/49	75. 2
127, 333	24, 347/45	75. 2.

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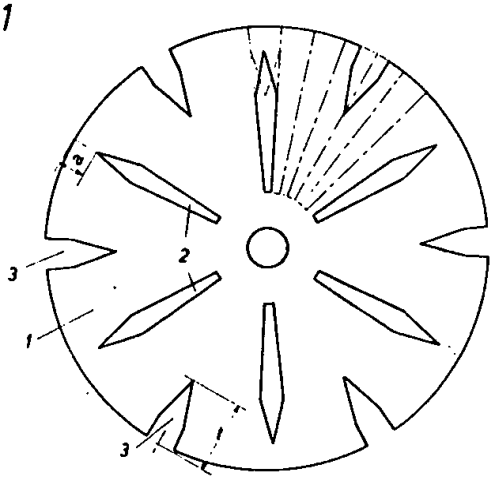
FIG. 1



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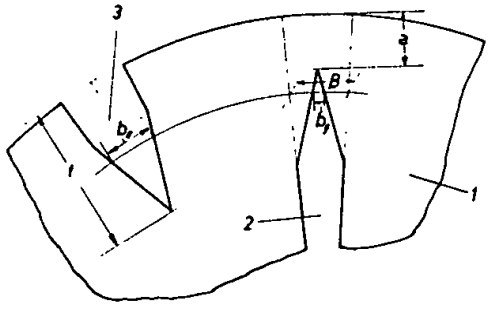


FIG. 2

FIG.3

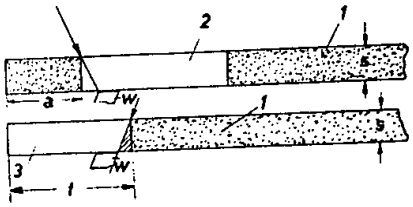
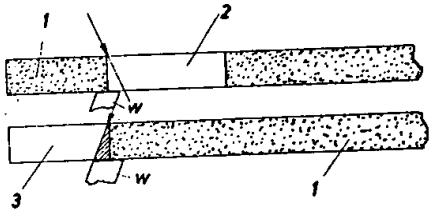


FIG.4



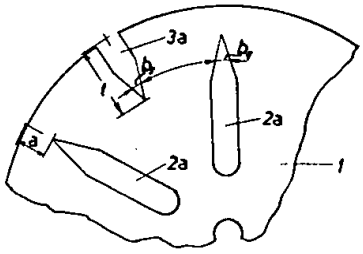


FIG.5